supply and drainage pipes. In canals the trapezoidal section is that which experience has almost universally established as the best wherever canals are carried through ordinary earth, and the rectangular section is only adopted when the sides are composed of coherent matter such as rock or masonry. The semicircular section for an open channel would not approximate to the shapes usually adopted in canals, but it may be worth remarking that the outline of the catenary of greatest area approaches more nearly to such shapes.

IV. "On the Heating Effects of Electric Currents. No. III." By W. H. Preece, F.R.S. Received March 15, 1888.

I have taken a great deal of pains to verify the dimensions of the currents, as detailed in my paper read on December 22, 1887, required to fuse different wires of such thicknesses that the law

$$C = ad^{3/2}$$

is strictly followed; and I submit the following as the final values of the constant "a" for the different metals:—

	Inches.	Centimetres.	Millimetres.
Copper	10,244	2,530	80·0
Aluminium	7,585	1,873	59·2
Platinum	5,172	1,277	40·4
German silver	5,230	1,292	40·8
Platinoid	4,750	1,173	37·1
Iron	3,148	777·4	24·6
Tin	1,642	405·5	12·8
Alloy (lead and tin 2 to 1)	1,318	325·5	10·3
Lead	1,379	340·6	10·8

With these constants I have calculated the two following tables, which I hope will be found of some use and value:—

Table showing the Current in Ampères required to Fuse Wires of Various Sizes and Materials.

$$C = ad^{3/2}.$$

No. S.W.G.	Diameter. Inches.	$d^{3/2}$.	Copper. $a = 10,244$.	Aluminium. $a = 7585$.	Platinum. $a = 5172$.	Ger. Silver. $a = 5230$.	Platinoid. $a = 4750$.	Iron. $a = 3148$.	Tin. $a = 1642$.	Tin-lead alloy. $a = 1318$.	Lead. $a = 1379$.
14	0·080	0·022627	231·8	171·6	117·0	118·3	107·5	71·22	37·15	29·82	31·20
16	0·064	0·016191	165·8	122·8	83·73	84·68	76·90	50·96	26·58	21·34	22·32
18	0·048	0·010516	107·7	79·75	54·37	54·99	49·95	33·10	17·27	13·86	14·50
20	0·036	0·006831	69·97	51·81	35·33	35·72	32·44	21·50	11·22	9·002	9·419
22	0·028	0·004685	48·00	35·53	24·23	24·50	22·25	14·75	7·692	6·175	6·461
24	0·022	0·003263	33·43	24·75	16·88	17·06	15·50	10·27	5·357	4·300	4·499
26	0·018	0·002415	24·74	18·32	12·49	12·63	11·47	7·602	3·965	3·183	3·330
28	0·0148	0·001801	18·44	13·66	9·311	9·416	8·552	5·667	2·956	2·373	2·483
30	0·0124	0·001381	14·15	10·47	7·142	7·222	6·559	4·347	2·267	1·820	1·904
32	0·0108	0·001122	11·50	8·512	5·805	5·870	5·330	3·533	1·843	1·479	1·548

Table giving the Diameters of Wires of Various Materials which will be Fused by a Current of Given Strength.

$$d = \left(\frac{C}{a}\right)^{2/3}.$$

Current in ampères.	Diameter in inches.								
	Copper. a = 10,244.	Aluminium. a = 7585.	Platinum. a = 5172.	Ger. Silver. a = 5230.	Platinoid. a = 4750.	Iron. a = 3148.	Tin. a = 1642.	Tin-lead alloy. a = 1318.	Lead. a = 1379.
1	0·0021	0·0026	0·0033	0·0033	0·0035	0·0047	0·0072	0·0083	0·0081
2	0·0034	0·0041	0·0053	0·0053	0·0056	0·0074	0·0113	0·0132	0·0128
3	0·0044	0·0054	0·0070	0·0069	0·0074	0·0097	0·0149	0·0173	0·0168
4	0·0053	0·0065	0·0084	0·0084	0·0089	0·0117	0·0181	0·0210	0·0203
5	0·0062	0·0076	0·0098	0·0097	0·0104	0·0136	0·0210	0·0243	0·0236
10	0·0098	0·0120	0·0155	0·0154	0·0164	0·0216	0·0334	0·0386	0·0375
15	0·0129	0·0158	0·0203	0·0202	0·0215	0·0283	0·0437	0·0506	0·0491
20	0·0156	0·0191	0·0246	0·0245	0·0261	0·0343	0·0529	0·0613	0·0595
25	0·0181	0·0222	0·0286	0·0284	0·0303	0·0398	0·0614	0·0711	0·0690
30	0·0205	0·0250	0·0323	0·0320	0·0342	0·0450	0·0694	0·0803	0·0779
35	0·0227	0·0277	0·0358	0·0356	0·0379	0·0498	0·0769	0·0890	0·0864
40	0·0248	0·0303	0·0391	0·0388	0·0414	0·0545	0·0840	0·0973	0·0944
45	0·0268	0·0328	0·0423	0·0420	0·0448	0·0589	0·0909	0·1052	0·1021
50	0·0288	0·0352	0·0454	0·0450	0·0480	0·0632	0·0975	0·1129	0·1095
60	0·0325	0·0397	0·0513	0·0509	0·0542	0·0714	0·1101	0·1275	0·1237
70	0·0360	0·0440	0·0568	0·0564	0·0601	0·0791	0·1220	0·1413	0·1371
80	0·0394	0·0481	0·0621	0·0616	0·0657	0·0864	0·1334	0·1544	0·1499
90	0·0426	0·0520	0·0672	0·0667	0·0711	0·0935	0·1443	0·1671	0·1621
100	0·0457	0·0558	0·0720	0·0715	0·0762	0·1003	0·1548	0·1792	0·1739
120	0·0516	0·0630	0·0814	0·0808	0·0861	0·1133	0·1748	0·2024	0·1964
140	0·0572	0·0698	0·0902	0·0895	0·0954	0·1255	0·1937	0·2243	0·2176
160	0·0625	0·0763	0·0986	0·0978	0·1043	0·1372	0·2118	0·2452	0·2379
180	0·0676	0·0826	0·1066	0·1058	0·1128	0·1484	0·2291	0·2652	0·2573
200	0·0725	0·0886	0·1144	0·1135	0·1210	0·1592	0·2457	0·2845	0·2760
225	0·0784	0·0958	0·1237	0·1228	0·1309	0·1722	0·2658	0·3077	0·2986
250	0·0841	0·1028	0·1327	0·1317	0·1404	0·1848	0·2851	0·3301	0·3203
275	0·0897	0·1095	0·1414	0·1404	0·1497	0·1969	0·3038	0·3518	0·3413
300	0·0950	0·1161	0·1498	0·1487	0·1586	0·2086	0·3220	0·3728	0·3617